

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: THIRY, Pol Jean-Marie Robert

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EXAMINER: Kilkenny, P.L.

TITLE: ORTHODONTIC WIRE AND METHOD FOR MAKING SAME

Amendment B: REMARKS

Upon entry of the present amendments, previous Claims 9 - 16 have been canceled and new Claim 17 substituted therefor. Reconsideration of the rejections, in light of the forgoing amendments and present remarks, is respectfully requested. The present amendments have been entered for the purpose of distinguishing the present invention from the prior art.

In the Office Action, it was indicated that Claim 9 was rejected under 35 U.S.C. § 102(b) as anticipated by the Palmer patent. Claims 10 - 16 were withdrawn from further consideration pursuant to 37 C.F.R. 1.142(b) as being drawn to a non-elected invention.

As an overview to the present reply, Applicant has amended independent Claim 9 in the form of new independent Claim 17. New independent Claim 17 expresses the limitations of previous independent Claim 9 but also states that the wire is formed "substantially entirely" of a titanium-molybdenum alloy. This limitations should distinguish the present invention from the prior art Palmer patent.

In the present invention, the orthodontic wire is formed of a titanium-molybdenum alloy. It has been known, in the past, it is possible to utilize titanium-molybdenum through the formation of orthodontic wire (see paragraph [0019] on page 5 of the original specification). However, the prior art does not provide an outer surface layer of a titanium nitride that is free of titanium oxide. As

such, the combination of the titanium oxide-free outer surface layer with the titanium-molybdenum alloy provides an orthodontic wire exhibiting superior qualities. This was stated in paragraphs [0046] and [0047] on page 10 of the original specification as follows:

The mean amplitude for the stress measured by the test machine, at each movement, comparatively characterizes the intensity of the static motion between the wire and the attachment.

The measured comparative values, according to the different types of tested wires are as follows:

- Stainless steel: 6.49
- Titanium-molybdenum alloy: 15.81
- Titanium-molybdenum alloy "low friction": 11.60
- Nitrided titanium-molybdenum alloy, according to the invention: 2.90

As such, the use of the titanium-oxide free outer surface layer of titanium nitride provides a considerable improvement of static and dynamic friction coefficients. This is achieved while preserving all the valuable mechanical properties made from titanium-molybdenum alloy.

In the present invention, the outer surface layer of titanium oxide-free titanium nitride is utilized so as to avoid any deterioration of the friction coefficient. This was stated on page 8, paragraph [0037] of the original specification as follows:

It permits to achieve titanium nitrides (TiN and Ti_2N) on the surface and within several microns in depth. Since the implantation of ions is made in the absence of oxygen, the creation of titanium oxides is avoided, the latter being able to deteriorate the friction coefficient and limit nitriding.

Applicant respectfully contends that the prior art Palmer patent fails to achieve such advantages and fails to include the limitations of independent Claim 17.

In the Palmer patent, the orthodontic wire is formed of a stainless steel alloy which can include titanium and molybdenum. This was stated in column 4, lines 8 - 16, as follows:

Orthodontic appliances constructed in accordance with the present invention are made at least in part of an iron-based alloy, and preferably a stainless steel alloy, that includes precipitates of titanium in an amount effective to strengthen the alloy. The alloy includes iron as the principal metal along with alloying elements of chromium and nickel.

The amount of titanium is relatively small in the composition of the orthodontic wire of the Palmer patent. In particular, in column 4, lines 28 - 30, it is stated that:

Preferably, the alloy includes titanium in the range of about 1% to about 4%, and more preferably in the range of about 1% to about 2%.

Additionally, the molybdenum as used in the Palmer patent in relatively small amounts. As was stated in column 4, lines 33 - 37:

Preferably, a small amount of molybdenum is added to improve the formation of martensite on cooling. The molybdenum also improves the corrosion resistance of the resultant appliance. Preferably, the molybdenum is present in an amount less than about 2%, and more preferably is present in an amount ranging from about 0.5% to about 1.5%.

In the Table on column 5 of the Palmer patent, the titanium is indicated as being 1-4 weight percent and the molybdenum is indicated as 0.5-2 weight percent of the total composition. As such, it is clear in the Palmer patent that the wire is not "formed substantially entirely of a titanium-molybdenum alloy".

In the Official Action, the Examiner has indicated that the Palmer patent discloses a surface layer of titanium nitride free of titanium oxide. Reference is particularly made to column 3, lines 25 -32, and column 5, lines 25 - 36. Applicant respectfully disagrees with the Examiner's analysis. The language of the Palmer patent states:

It has been found that the titanium in the alloy of the present invention can form nitrides under certain conditions during heat treatment in such a manner that a surface layer having a color resembling straw or light gold is produced. The presence of this aesthetic color can be controlled by introducing nitrogen gas into the atmosphere surrounding the appliances during heat treatment so that a significant titanium nitride layer is formed.

The language in column 5, lines 25 - 36 states as follows:

The alloy of the present invention may be processed for machining and strengthening in the same manner as other known stainless steels. These methods commonly include a solution treatment of the alloying elements at an elevated temperature (e.g., 1800°F. or 980°C.), followed by quenching to room temperature, and then aging at an intermediate temperature (e.g., 1000°F. or 540°C.) to promote the precipitation of strengtheners. Using these conditions in a nitrogen atmosphere will produce an aesthetic titanium nitride coating on the appliance that exhibits a light gold or straw color. This coating may also include titanium aluminum nitride.

From the language of these paragraphs, Applicant respectfully contends that there is no teaching of the use of "a surface layer of titanium nitride free of titanium oxide". This is evidenced by the fact that neither of these paragraphs describes the advantages of such titanium oxide-free titanium nitride outer surface layer as in the present invention. In particular, there is no suggestion in the Palmer patent that it is possible to achieve a better friction coefficient. The Palmer patent merely utilizes such step to provide color to the orthodontic wire.

On this basis, Applicant contends that the prior art Palmer patent fails to show the limitations of the present invention as defined by independent Claim 17. Quite clearly, the Palmer patent does not disclose a wire formed "substantially entirely" of a titanium-molybdenum alloy. The Palmer patent does not describe the formation of an outer surface layer of a titanium nitride that is "free of a titanium oxide". As such, Applicant respectfully contends that the Palmer patent does not

anticipate the limitations of the present invention under 35 U.S.C. § 102(b).

Applicant has canceled Claims 10 - 16 herein as being drawn to a non-elected invention.

Based upon the foregoing analysis, Applicant contends that independent Claim 17 is now in proper condition for allowance. Reconsideration of the rejections and allowance of the claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

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